

Claims

1. An array substrate comprising:
 - a gate line;
 - 5 a data line crossing the gate line to define a pixel region that includes first and second regions;
 - a switching device that is electrically connected to the gate line and the data line;
 - a transmissive electrode that is electrically connected to the switching device,
 - 10 the transmissive electrode being formed in the first region;
 - a reflective electrode that is electrically insulated from the transmissive electrode, the reflective electrode being formed in the second region that is adjacent to the first region; and
 - a compensating wiring that is electrically connected to the switching device,
 - 15 the compensating wiring facing the reflective electrode in the second region with an insulation layer interposed between the compensating wiring and the reflective electrode.
2. The array substrate of claim 1, wherein the switching device
- 20 corresponds to a thin film transistor comprising a gate electrode that is electrically connected to the gate line, a source electrode that is electrically connected to the data line, and a drain electrode that is electrically connected to the transmissive electrode and the compensating wiring.
- 25 3. The array substrate of claim 1, wherein the compensating wiring and the data line are formed from a same layer.

4. An array substrate comprising:
- a first gate line;
 - a second gate line that is electrically insulated from the first gate line;
 - a data line crossing the first and second gate lines to define a pixel region that
- 5 includes first and second regions;
- a first switching device that is electrically connected to the first gate line and the data line;
 - a second switching device that is electrically connected to the second gate
- 10 line;
- a transmissive electrode that is electrically connected to the second switching device, the transmissive electrode being formed in the first region;
 - a reflective electrode that is electrically insulated from the transmissive electrode, the reflective electrode being formed in the second region that is adjacent to the first region; and
- 15 a compensating wiring that is electrically connected to the first switching device, the compensating wiring facing the reflective electrode and the transmissive electrode with an insulation layer interposed between the compensating wiring and the reflective electrode and between the compensating wiring and the transmissive electrode.
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5. The array substrate of claim 4, wherein the first switching device corresponds to a first thin film transistor including a gate electrode that is electrically connected to the second gate line, a source electrode that is electrically connected to the data line, and a drain electrode that is electrically connected to the
- 25 compensating wiring.
6. The array substrate of claim 4, wherein the second switching device

corresponds to a second thin film transistor including a gate electrode that is electrically connected to the first gate line, a source electrode that is electrically connected to a ground voltage, and a drain electrode that is electrically connected to the transmissive electrode.

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7. The array substrate of claim 6, further comprising a third thin film transistor that includes a gate electrode that is electrically connected to the first gate line, a source electrode that is electrically connected to the data line, and a drain electrode that is electrically connected to the compensating wiring.

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8. The array substrate of claim 4, wherein the second switching device corresponds to the second thin film transistor including a gate electrode that is electrically connected to the first gate line, a source electrode that is electrically connected to the data line, and a drain electrode that is electrically connected to the transmissive electrode and the compensating wiring.

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9. The array substrate of claim 4, further comprising a circuit for allowing the first gate line to maintain a first driving signal until the second gate line receives a second driving signal.

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10. The array substrate of claim 4, wherein the compensating wiring and the data line are formed from a same layer.

11. A liquid crystal display apparatus comprising:

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i) a first substrate including:

a gate line;

a data line crossing the gate line to define a pixel region that includes

first and second regions;

a switching device that is electrically connected to the gate line and the data line;

5 a transmissive electrode that is electrically connected to the switching device, the transmissive electrode being formed in the first region;

a reflective electrode that is electrically insulated from the transmissive electrode, the reflective electrode being formed in the second region that is adjacent to the first region; and

10 a compensating wiring that is electrically connected to the switching device, the compensating wiring facing the reflective electrode in the second region with an insulation layer interposed between the compensating wiring and the reflective electrode;

ii) a second substrate including a common electrode that faces the transmissive electrode and the reflective electrode; and

15 iii) a liquid crystal layer interposed between the first and second substrates.

12. A liquid crystal display apparatus comprising:

i) a first substrate including:

a first gate line;

20 a second gate line that is electrically insulated from the first gate line;

a data line crossing the first and second gate lines to define a pixel region that includes first and second regions;

a first switching device that is electrically connected to the first gate line and the data line;

25 a second switching device that is electrically connected to the second gate line;

a transmissive electrode that is electrically connected to the second

switching device, the transmissive electrode being formed in the first region;

a reflective electrode that is electrically insulated from the transmissive electrode, the reflective electrode being formed in the second region that is adjacent to the first region; and

5 a compensating wiring that is electrically connected to the first switching device, the compensating wiring facing the reflective electrode and the transmissive electrode with an insulation layer interposed between the compensating wiring and the reflective electrode and between the compensating wiring and the transmissive electrode;

10 ii) a second substrate including a common electrode that faces the transmissive electrode and the reflective electrode; and

iii) a liquid crystal layer interposed between the first and second substrates.

13. A liquid crystal display apparatus comprising:

15 a first substrate including first and second switching devices, a transmissive electrode and a reflective electrode, the first switching device being electrically connected to a data line and a gate line, the second switching device being electrically connected to the first switching device, the transmissive electrode and the reflective electrode being electrically connected to the first and second switching
20 devices respectively or reverse;

a second substrate including a common electrode that faces the first and second electrodes; and

a liquid crystal layer interposed between the first and second substrates.

25 14. The liquid crystal display device of claim 13, wherein the first switching device corresponds to a first NMOS transistor including a first electrode that is electrically connected to the data line, a second electrode that is electrically

connected to the gate line, and a third electrode that is electrically connected to the transmissive electrode, and

the second switching device corresponds to a second NMOS transistor including a fourth electrode that is electrically connected to the third electrode, a
5 fifth electrode that is electrically connected to the gate line, and a sixth electrode that is electrically connected to the reflective electrode.

15 15. The liquid crystal display device of claim 13, wherein a first voltage that is applied to the reflective electrode is lower than a second voltage that is applied to the transmissive electrode.

16. A liquid crystal display device comprising:

a first substrate including a switching device that is electrically connected to a data line and a gate line, a transmissive electrode that is electrically connected to the
15 switching device, a reflective electrode that is electrically connected to the switching device, and a metal wiring facing the reflective electrode with an insulation layer interposed between the metal wiring and the reflective electrode;

a second substrate including a common electrode facing the transmissive electrode and the reflective electrode; and

20 a liquid crystal layer that is interposed between the first and second substrates.

17. The liquid crystal display apparatus of claim 16, wherein the gate line protrudes to form the metal wiring that faces the reflective electrode.

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18. A liquid crystal display apparatus comprising:

a first substrate including a pixel region having a switching device, a plurality

of pixel electrodes electrically connected to the switching device;

a second substrate including a plurality of common electrodes, each of the common electrode corresponding to each of the pixel electrodes; and

5 a liquid crystal layer that is interposed between the first and second substrates.

19. The liquid crystal display apparatus of claim 18, wherein the pixel electrodes comprise:

10 a transmissive electrode that allows a first light provided from a backside of the first substrate to transmit the transmissive electrode; and

a reflective electrode that reflects a second light provided from a front side of the second substrate.

20. The liquid crystal display apparatus of claim 19, wherein the common electrodes comprise:

a first common electrode that faces the transmissive electrode; and

a second common electrode that is electrically insulated from the first common electrode, the second common electrode facing the reflective electrode.

20 21. The liquid crystal display apparatus of claim 20, wherein a first voltage is applied to the first common electrode, and a second voltage that is lower than the first voltage is applied to the second common electrode.

22. A method of driving a liquid crystal display apparatus, comprising:

25 applying a gate voltage to a gate line;

outputting a data voltage that is provided from a data line in response to the gate voltage;

applying the data voltage to a transmissive electrode as a transmissive voltage;

applying a reflective voltage generated from the data voltage to a reflective electrode, the reflective voltage being lower than the data voltage; and

5 applying a reference voltage to a common electrode that faces the reflective electrode and the transmissive electrode.

23. A method of driving a liquid crystal display apparatus, comprising:

applying a first gate voltage to a first gate line;

10 outputting a first data voltage that is provided from a data line in response to the first gate voltage;

applying a transmissive voltage generated from the first data voltage to a transmissive electrode, the transmissive voltage being higher than the first data voltage;

15 applying a reflective voltage generated from the first data voltage to a reflective electrode, the reflective voltage being lower than the first data voltage; and

applying a reference voltage to a common electrode that faces the reflective electrode and the transmissive electrode.

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24. The method of claim 23, prior to applying the first voltage to the first gate line, further comprising:

applying a second gate voltage to a second gate line;

outputting a ground voltage in response to the second gate voltage;

25 applying the ground voltage to the transmissive electrode; and

applying a voltage that is lower than the ground voltage to the reflective electrode.

25. The method of claim 24, wherein the second gate line maintains a second driving voltage until the first driving voltage is applied to the second gate line.

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26. The method of claim of 23, prior to applying the first voltage to the first gate line, further comprising:

applying a second gate voltage to a second gate line;
outputting a ground voltage in response to the second gate voltage;
10 outputting a second data voltage provided from the data line in response to the second gate voltage;
applying the ground voltage to the transmissive electrode; and
applying the second data voltage to the reflective electrode.

15 27. The method of claim of 26, wherein a phase of the second data voltage is in reverse with a phase of the first data voltage.

28. The method of claim of 23, further comprising:
applying a second gate voltage to the second gate line;
20 outputting a second data voltage provided from the data line in response to the second gate voltage;
applying the second data voltage to the transmissive electrode; and
applying a lowered data voltage that is lowered from the second data voltage to the reflective electrode, before applying a first gate voltage to a first gate line.

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29. The method of claim of 28, wherein the second data voltage has a same phase as the first data voltage.